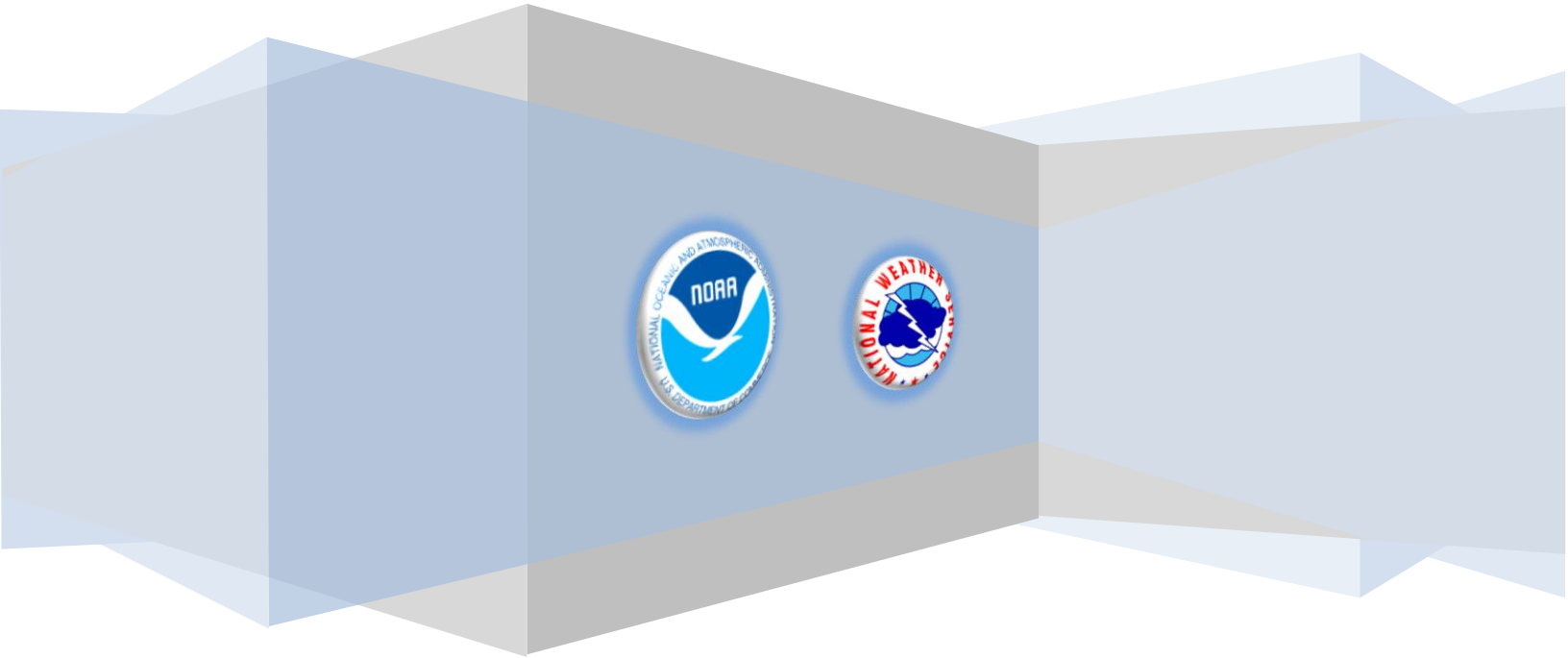
Natural Hazards Assessment

Clayton County, IA

Prepared by: NOAA / National Weather Service La Crosse, WI



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for
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Prepared by NOAA / National Weather Service – La Crosse
Last Update: June 2010

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Overview

Clayton County, IA is in the Upper Mississippi River Valley of the Midwest with relatively hilly terrain and bluffs. It is bordered by the Mississippi River to the east.

The area experiences a temperate climate with both warm and cold season extremes.

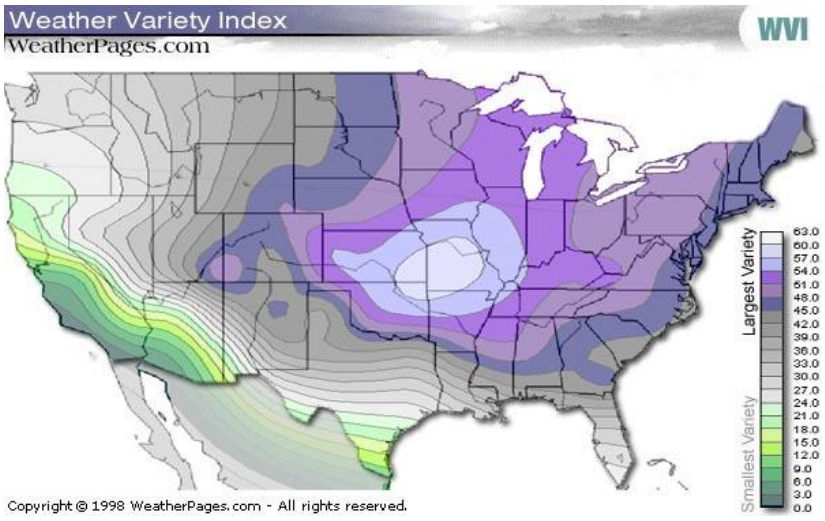
Winter months can bring occasional heavy snows, intermittent freezing precipitation or ice, and prolonged periods of cloudiness. While true blizzards are rare, winter storms impact the area on average about 3 to 4 times per season. Occasional arctic outbreaks bring extreme cold and dangerous wind chills.

Temperatures between river valleys and surrounding ridges can vary greatly. Typically high temperatures on ridges are 3° to 5°F colder than valleys. This can lead to slightly more average snowfall on ridge tops and occasionally a difference in winter precipitation types from ridge to valley.

Thunderstorms occur on average 30 to 50 times a year, mainly in the spring and summer months. The strongest storms can produce associated severe weather like tornadoes, large hail, or damaging wind. Both river flooding and flash flooding can occur, along with urban-related flood problems. The terrain can lead to mud slides and generally increases the flash flood threat. Heat and high humidity is occasionally observed in June, July, or August.

The autumn season usually has the quietest weather. Valley fog is most common in the late summer and early fall months. On calm nights, colder air settles into valleys leading to colder low temperatures compared to ridge top locations. High wind events can also occur occasionally, usually in the spring or fall.

The variability in weather can be seen in the following graphic, created by a private company (weatherpages.com) that rated each city on variations in temperature, precipitation, and other factors. Waterloo, IA ranked 10th and Dubuque, IA ranked 29th highest in variability out of 277 cities.

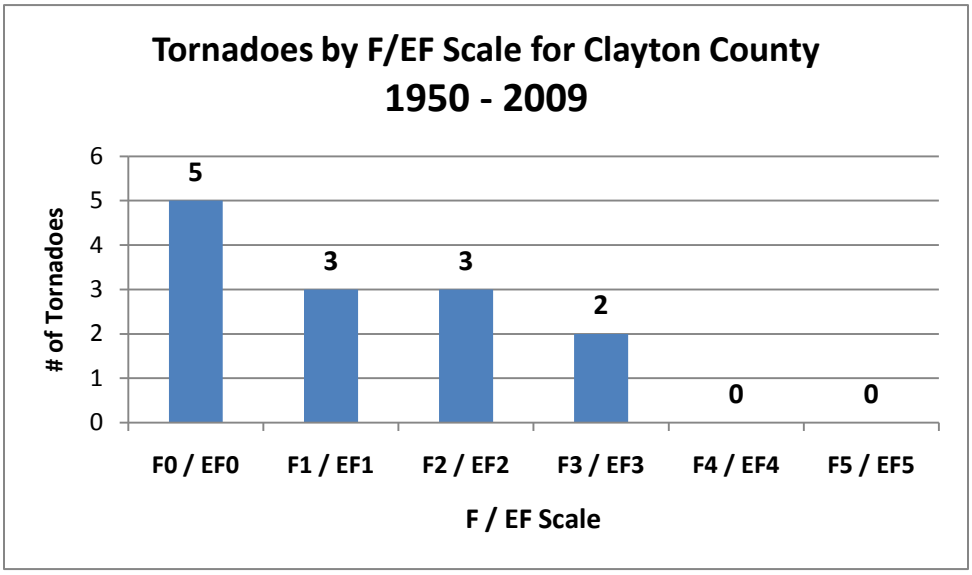


Since 1998, Clayton County has been included in a FEMA Federal Disaster Declaration 7 times:

1998 – Severe storms / flooding
1999 – Severe storms / flooding
1999 – Severe storms/ flooding
2001 – Severe storms / flooding
2002 – Severe storms / flooding
2004 – Severe storms / flooding
2008 – Severe storms / flooding

Tornadoes

Even though Iowa averages about 47 tornadoes per year, Clayton County has only had 13 documented tornadoes since 1950, averaging about one tornado every 4-5 years. Most tornadoes are short-lived and small. May and June are the peak months and most occur between 3 and 9 p.m., but they can occur nearly any time of year and at all times of the day.



Most recent tornadoes:

- Mar.31,2007(EF1*)
- May 10, 2001 (F0)
- May 25, 1994 (F1)
- June 19, 1992 (F1)
- June 19, 1992 (F0)
- June 13, 1990 (F2)
- June 26, 1989 (F0)
- May 24, 1989 (F0)
- Nov.15, 1988 (F0)
- May 30, 1985 (F3)
- Aug.25, 1965 (F2)

One of the strongest tornadoes to hit Clayton County in more recent years was a storm that produced an F3 tornado on May 30, 1985. It touched down west of Elkader, IA and tracked east-northeast killing two residents at a county care facility. Numerous farms and homes were hit along the path with damage estimates around $9 million. In 1918, a killer tornado hit the southern part of Guttenberg, IA and a major tornado also struck near Colesburg, IA way back in 1899.

Strongest tornadoes: (1850-2008)

- May 21, 1918 (F4) – 100 inj, 8 dead
- May 16, 1899 (F4) – 14 inj, 4 dead
- June 12, 1915 (F4) – 1 inj, 0 dead
- May 30, 1985 (F3) – 27 inj, 2 dead

June 11, 1883 (F3) – 8 inj, 0 dead

Clayton County Tornado Facts:

- No F5 or EF5* tornadoes
- Three F4 and four F3 tornadoes
- 14 deaths and 161 injuries since 1850
- Tornadoes have occurred April – November
- Most have occurred in May (8)

Tornado Watches		Tornado Warnings	
Year		Year	
2009	6	2009	3
2008	10	2008	2
2007	6	2007	0
2006	2	2006	0
2005	8	2005	0
2004	13	2004	0
2003	6	2003	0
2002	4	2002	1
2001	2	2001	2
2000	7	2000	1

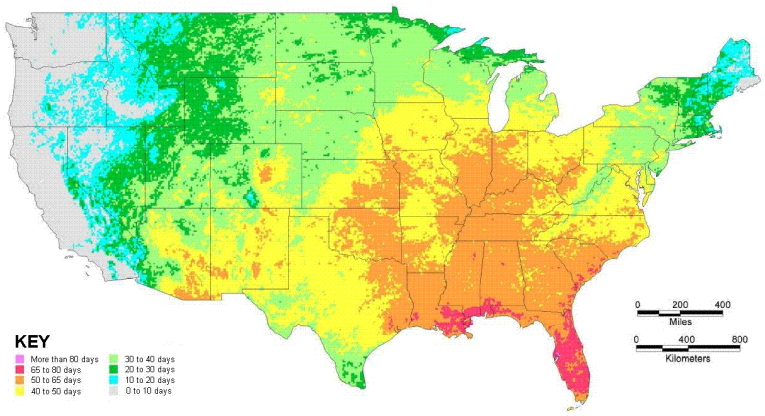
Enhanced Fujita (EF*) Scale	
EF0	65-85 mph
EF1	86-110 mph
EF2	111-135 mph
EF3	136-165 mph
EF4	166-200 mph
EF5	>200 mph

* Started February 1, 2007

Severe Thunderstorms / Lightning

Clayton County averages 44 thunderstorm days per year. The National Weather Service (NWS) considers a thunderstorm severe when it produces wind gusts of 58 mph (50 knots) or higher, 3/4 inch diameter hail or larger, or a tornado.

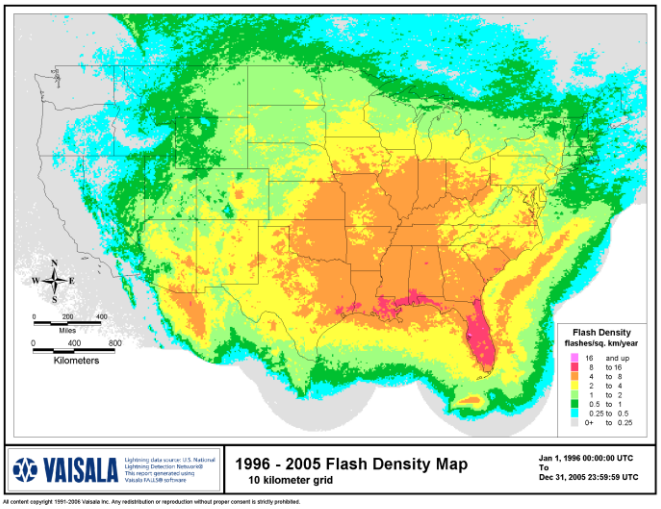
Average Number of Thunderstorm Days per Year



Downdraft winds from a severe thunderstorm can produce local or widespread damage, even tornado-like damage if strong enough. Most severe thunderstorm winds occur in June or July and between the hours of 4 and 8 p.m., but can occur at other times. Most damage involves blown down trees, power lines, and damage to weaker structures (i.e. barns, outbuildings, garages) with occasional related injuries. In July 2006, severe thunderstorms produced damaging wind in McGregor and Guttenberg, IA with gusts as high as 70 mph. Storms in July 1995 produced winds greater than 80 mph with lots of damage. There have been 103 damaging wind reports since 1955 in the county.

Large hail can also occur in a severe thunderstorm. May and June are the peak months with the most common time between 1 and 9 p.m., but it can occur in other warm season months and at any time of day. Hail is typically a crop damaging hazard but can damage roofs, windows, and vehicles if large enough (> 1"). Expenses can be high. Injuries or fatalities are rare for hail. Hail as large as golf balls was reported twice in Clayton County in 2008. There have even been two instances where hail reached 2 inches in diameter or larger going back to the late 1970s. There have been 96 large hail (≥ 3/4") reports in the county since 1955.

Non-severe thunderstorms still pose a lightning risk. According to the Vaisala Group, an average of 546,989 cloud-to-ground strikes hit Iowa each year based on data from 1996 to 2005. Nationally, Iowa ranks 30th in lightning related fatalities with 4 deaths reported since 1998. There was a lightning fatality in Iowa in 2008 when a 20 year old male was struck in his yard at home.



Severe Thunderstorm Watches		Severe Thunderstorm Warnings	
Year		Year	
2009	8	2009	8
2008	12	2008	9
2007	12	2007	11
2006	18	2006	4
2005	11	2005	3
2004	23	2004	7
2003	12	2003	10
2002	17	2002	4
2001	18	2001	6
2000	16	2000	11

Flooding and Hydrologic Concerns

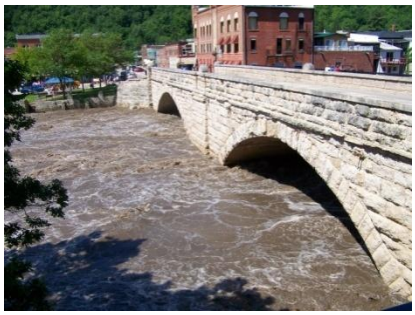
On occasion intense, heavy rain producing thunderstorms or consecutive thunderstorms ("training") can bring excessive rainfall leading to flash flooding in Clayton County. The hilly terrain promotes rapid run-off and enhances the threat. Mudslides can occur in extreme cases.

June is the most common month for flash floods, but they can occur from May through September. They are most common in the evening hours, between 8-10 p.m., but can occur at other times and typically last from 3-6 hours. Since 1993, there have been 8 deaths from flooding in Iowa.

Flash Flood Warnings	
Year	
2009	3
2008	6
2007	2
2006	0
2005	0
2004	4
2003	1
2002	1
2001	0
2000	1

In June 2008, widespread 3-7" rainfall totals over a two day period led to significant flash flooding and eventual river flooding. Numerous roads were closed from mudslides. At least 4000 acres of farm land were flooded with over $10 million in property damage and $23 million in crops. There was also significant flash flooding in 1993, 1999, 2001, 2004, and 2007.

Three main rivers can impact Clayton County – the Mississippi River, the Turkey River, and the Volga River. The Mississippi River is often highest in the spring associated with the seasonal snowmelt, but on rare occasions can reach flood stage during the summer or fall from heavy rain patterns. The combination of up-river snowmelt and area rain brought major flooding along the Mississippi River in April 2001, setting the 2nd highest crest levels in many locations. The record crest year remains 1965.



Flooding along the Turkey and Volga Rivers can be a bit more frequent, usually stemming from heavy rain patterns as opposed to snowmelt. In June 2008 record crests were observed on the Turkey River with 3rd highest values on the Volga River. Major flooding was also observed in 1991, 1999, and 2004. Damage was extensive. (Photos left: Flooding at Elkader and Garber, IA - 2008)

Turkey River @ Elkader, IA Top 5 Crests (FS: 12 feet)	
Year	Crest
2008	30.90'
1991	27.33'
2004	25.57'
1990	20.50'
1999	19.35'

The US Army Corps of Engineers maintains a Lock and Dam (#10) at Guttenberg, IA that is used to manage navigational water levels, not for flood control. (Photo below)

Mississippi River @ Guttenberg, IA Top 5 Crests (FS: 15 feet)	
Year	Crest
1965	23.65'
2001	21.68'
1993	20.15'
1969	19.84'
1952	19.69'

Winter Storms and Extreme Cold

Hazardous winter weather can bring a variety of conditions to Clayton County. Since 1982, an average of 3-4 winter storms impact the area each season. The terrain in the county does limit the number of true blizzards (only 2 since 1982) but heavy snow, blowing snow, ice, and sleet all occur. There have been a total of 12 documented deaths and 23 injuries as a direct result from winter storms in Iowa since 1993.

The 30-year average seasonal snowfall at Elkader is 36.3 inches. The highest one-day snowfall is 20.0 inches set on March 8, 1961. The bulk of snow falls between December and March. The largest winter storms tend to form over the central or southern Plains, then move northeast towards the western Great Lakes.

Top 5 Seasonal Snowfalls at Elkader, IA	
Years	Snowfall
1950-51	93.1”
1961-62	77.9”
1938-39	76.9”
1935-36	69.1”
1942-43	69.0”

On January 26, 1996, a major winter storm and blizzard impacted northeast Iowa. Heavy snow with reports of lightning and thunder brought a foot of snow to the Guttenberg area with 10.0” reported at Elkader, IA. Very strong winds caused extensive blowing and drifting. Heavy snow hit the county in early February 2008 as well with 10.0” reported in Guttenberg and 8.4” in Elkader, IA.

December 8-9, 2009 brought a major blizzard to the region that dropped 14.5” of snow at Strawberry Point and over 10” across most of the county.

March can often be a snowy month. Even though snowfall may be less frequent, heavy wet snow can form from large spring storms.

Ice storms (1/4” of ice or more) can occur but are relatively rare with only 5 occurrences since 1993.

Arctic cold outbreaks can occur in the upper Midwest as well. Snow depth can modify these cold temperatures leading to sub-zero readings on average 25 times a winter. Occasionally strong northwest winds will combine with arctic outbreaks to create dangerous wind chill conditions as well. The coldest temperatures are usually in January and February with average lows in the single digits and record lows colder than -25°F most days. The all-time record low is -47°F set in 1996.

Coldest Lows at Elkader, IA	
Low	Date
-47°F	2/3/1996
-40°F	1/30/1951
-38°F	2/4/1996
-37°F	1/31/1996
-37°F	1/20/1994

In 1996, Elkader went 6 consecutive days with temperatures at or below zero degrees (F) following the blizzard discussed above. Low temperatures of -37°F, -23°F, -32°F, -47°F, and -38°F were set on five straight mornings.

Since 1993 there have been 5 fatalities in Iowa from cold weather.

The La Crosse National Weather Service issues Wind Chill Advisories when wind chill readings of -20°F to -34°F are expected. Wind Chill Warnings are issued when wind chill values at or below -35°F are expected or occurring. In late January 2008, a wind chill of -43°F was reported from the Monona, IA area.

Heat, Drought, and Wildfires

On occasion the weather pattern across the upper Midwest favors prolonged heat and humidity, leading to heat waves. June through August are the warmest months with average high temperatures in the 80s and record highs above 100°F most days. The warmest temperature on record at Elkader, IA is 111°F set on July 24, 1901.

Warmest Highs at Elkader, IA	
High	Date
111°F	7/24/1901
110°F	7/21/1901
109°F	7/23/1901
108°F	7/13/1936
108°F	7/14/1936

In Clayton County there have 5 heat waves since 1993. During that same time period, there were 4 fatalities directly related to heat waves in Iowa.

A prolonged heat wave hit Clayton County from June 21 - July 29, 1901 when the temperature hit 90°F or higher every day except for 4. Readings hit 100°F or warmer 22 times during that stretch. In July 1936, the high temperatures hit 100°F or higher for 11 consecutive days. In more recent years, heat waves struck in 1995, 1997, 1999, and 2001.

Prolonged dry spells can also lead to drought causing extreme damage to crops. Droughts vary in length and intensity but abnormally dry to moderate drought conditions can occur quite frequently. Severe to extreme droughts occur far less frequently.

The last drought in Clayton County was 1995, but droughts have hit parts of Iowa in more recent years, including 1999, 2000, 2001, 2003, 2005, and 2006

Dry weather can also lead to a wildfire threat, especially in the spring before foliage has emerged (i.e. before green up) or in the fall after vegetation has started to die off. Warm, dry (i.e. lower relative humidities), and windy conditions all favor higher fire danger and can lead to sporadic grass fires in Clayton County. Thick, wooded areas also pose a threat for wildfires under extremely dry conditions but occur far less frequently.

Local Climatology

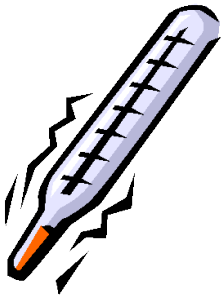
Here are some basic climatology figures for the Clayton County area. Data is valid for Elkader, IA based on normals from a 30-year period (1971-2000).

Month	Normal Maximum Temperature	Normal Minimum Temperature	Average Temperature	Precipitation	Snowfall
JAN	26.9	6.7	16.8	1.03”	9.6”
FEB	33.2	12.6	22.9	1.18”	7.1”
MAR	45.6	23.7	34.7	2.04”	5.0”
APR	60.3	34.9	47.6	3.59”	2.0”
MAY	72.2	45.5	58.9	3.97”	0.0”
JUN	80.9	54.5	67.7	4.51”	0.0”
JUL	84.5	59.4	71.9	4.00”	0.0”
AUG	82.3	57.7	70.0	4.67”	0.0”
SEP	74.8	48.7	61.7	3.13”	0.0”
OCT	62.9	37.6	50.2	2.40”	0.2”
NOV	44.9	25.5	35.2	2.44”	4.1”
DEC	31.0	13.0	22.0	1.21”	8.4”
Year	58.3	35.0	46.6	34.17”	36.3”

Miscellaneous facts:

- Warmest year on record – 1987 (50.8°F)
- Warmest month on record – July 1901 (83.4°F)
- Warmest day on record – July 24, 1901 (111°F)
- Greatest number of days with 90°F or warmer – 1988, 1910, and 1894 (59 times)

- Coldest year on record – 1917 (41.4°F)
- Coldest month on record – January 1912 (-1.3°F)
- Coldest day on record – February 3, 1996 (-47°F)
- Greatest number of days at 0°F or colder – 1978 (51 times)

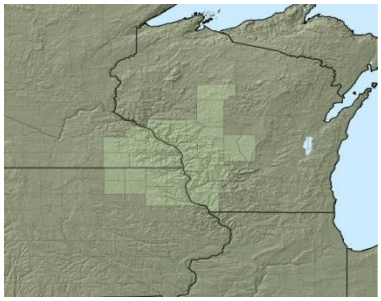


- Wettest year on record – 1902 (50.01”)
- Wettest month on record – July 1903 (12.72”)
- Wettest day on record – July 26, 1940 (6.67”)
- Driest year on record – 1988 (21.09”)
- Driest month on record – Numerous

- Highest seasonal snowfall on record – 1950/51 (93.1”)
- Highest monthly snowfall on record – March 1951 (40.6”)
- Highest one-day snowfall on record – March 8, 1961 (20.0”)
- Least seasonal snowfall on record – 1967/68 (10.8”)

NOAA/National Weather Service Support and Weather Monitoring

NOAA's National Weather Service (NWS) forecast office at La Crosse, WI serves Clayton County with weather information and support on a continuous basis. Operating 24 hours a day, a staff of 23 issues routine and non-routine informational products for the area, including all watches, warnings, and advisories related to natural hazards. Doppler radar (WSR-88D) is co-located with the La Crosse NWS office and covers the region.



NWS La Crosse has a web site at: www.weather.gov/lacrosse

Normal communication during hazardous weather scenarios is via telephone.

NOAA Weather Radio coverage in Clayton County includes two stations: WWG86 (Prairie du Chien) on 162.500 MHz and WXL64 (Dubuque) on 162. 400 MHz.

Storm spotter groups consist of almost entirely fire department personnel. Spotter training is held annually with an average attendance in the past 5 years of 78.

There are a variety of weather monitoring sources in or near Clayton County, including:

Automated weather station(s):

- Prairie du Chien (KPDC)

River Gauge(s):

- Mississippi River Lock & Dam #10 @ Guttenberg
- Mississippi River @ Clayton
- Mississippi River @ McGregor
- Turkey River @ Elkader
- Turkey River @ Garber
- Volga River @ Littleport
- Bloody Run Creek @ Marquette

Cooperative Observers

- Elkader 1SE
- Elkader 6SSW
- Guttenberg Lock & Dam 10
- McGregor
- Strawberry Point

In addition, numerous volunteer reports from around the county are received at the La Crosse NWS office including rainfall, snowfall, and temperatures, on a routine basis.

Resources

National Weather Service – La Crosse	www.weather.gov/lacrosse
NWS La Crosse Tornado Database	www.weather.gov/lacrosse/?n=tornadomain
NWS La Crosse River Monitoring	http://www.crh.noaa.gov/ahps2/index.php?wfo=arx
NWS La Crosse Climate	www.weather.gov/climate/index.php?wfo=arx
NWS La Crosse Drought information	www.weather.gov/lacrosse/?n=drought
NWS La Crosse Storm Summaries	www.weather.gov/lacrosse/?n=events
NWS La Crosse NOAA Weather Radio page	www.weather.gov/lacrosse/?n=nwr
NWS Storm Prediction Center	http://www.spc.noaa.gov/
SPC Online Severe Weather Climatology	http://www.spc.nssl.noaa.gov/climo/online/grids/ http://www.spc.noaa.gov/climo/online/rda/ARX.html

Contact information: Todd Shea
Warning Coordination Meteorologist
NWS La Crosse
todd.shea@noaa.gov

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